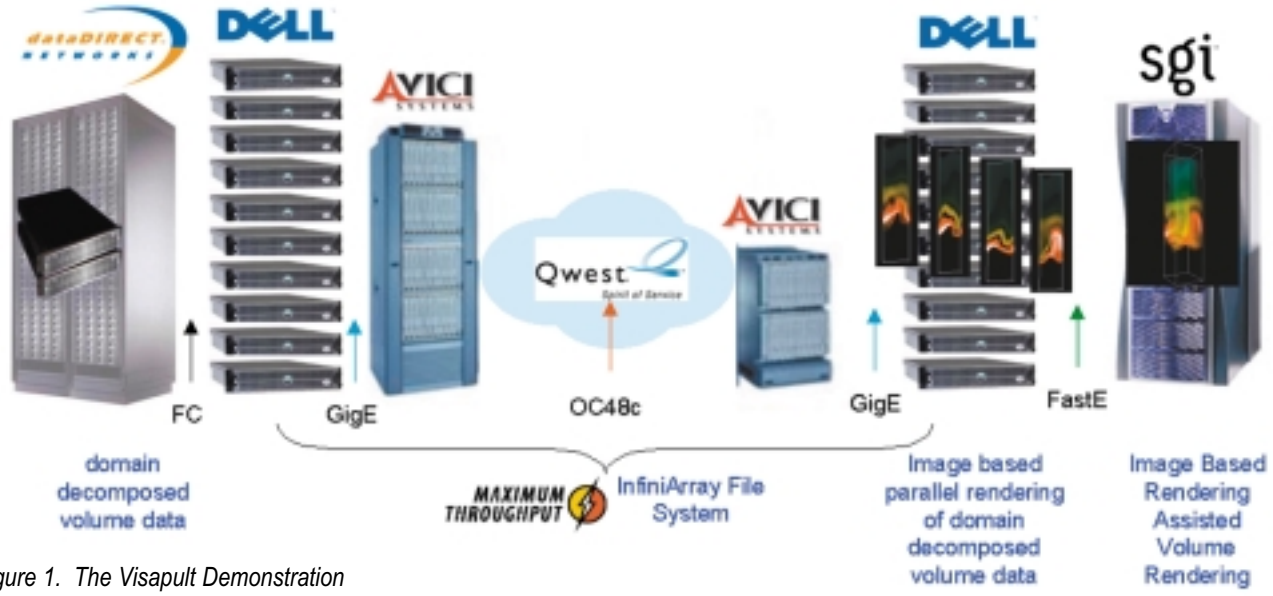

Figure 1. The Visapult Demonstration

Infrastructure, Data Services, and Visualization

The ability to do effective problem setup and analysis of simulation results is critical to a balanced, ASCI problem-solving environment [1]. Research scientists and analysts must be able to efficiently design complex computational experiments, and to "see and understand" the results of those experiments in a manner that enables unprecedented confidence in simulation results.

We demonstrate two visualization techniques that utilize a 2.5 Gbps wide area network infrastructure to deliver data services for the management and comprehension of large and complex simulation data sets: 1) The LBL Visapult [2] using a scalable Cluster File System [3]. 2) The Sandia Interactive Video System [4] visualizing a remote, interactive Ensight session.

The Infrastructure

Large-scale simulation need high-speed networks and advanced middleware in order to couple, manage, and access the distributed, high-performance computing systems, and the massive data archives. This demonstration implements the infrastructure using the 2.4 Gbps bandwidth contributed by Qwest [5], connecting SNL and LBL at California to the convention center at Baltimore, for the duration of the Supercomputing Conference.

We select the Avici switch router to implement the core infrastructure because of its tera scale performance. The Avici switch router [6] uses a 3-D torus network in its fabric to achieve high-performance and scalability. In addition, it can deliver QoS constrained scheduling at line-rate for the multi-disciplined ASCI Data Services.

Large parallel applications generate massive amounts of data, requiring scalable and high-performance cluster file systems for

Figure 2. Enhanced Virginia Hydrodynamics #1 (EVH1) - Profile

concurrent access of data from a large number of compute nodes. Maximum Throughput is Sandia's partner to design and develop such a file system (InfiniArray File System or IAFS). This demonstration explores performance parameters in IAFS to deliver high-performance file sharing for applications on local and remote compute clusters.

We run the distributed IAFS on two DELL PowerEdge 2650 [7] clusters, the server component of IAFS at SNL/Ca and the client at the ASCI Booth. IAFS communicates control and data I/O over Gigabit Ethernet. Storage I/O is Fibre Channel based. We selected the S2A 8000 Silicon Storage Appliance from DataDirect Networks as the IAFS back-end to store the 800-GB dataset of a NERSC calculation [9] for the Visapult demonstration.

Visapult is an application and framework for distributed, direct volume rendering. Visapult consists of two software components that work in a pipelined fashion in order to perform volume rendering. For this demonstration, the viewer component runs on the SGI Onyx [10] at the Booth. It achieves interactive frame rates with large datasets using the IBRAVR technique (Figure 1). The Visapult back end is a parallel application that runs on the DELL cluster also at the ASCI Booth. It performs data loading, via IAFS, as well as partial rendering in parallel.

The Sandia Interactive Remote Visualization Prototype

V21001 is designed and developed to offer the power of graphics supercomputers to remote users. In this demonstration, we connect two V2001 encoders to the DVI ports of an SGI Octane at SNL/CA. The Encoders capture and encode the video signal from an interactive Ensight session, visualizing the results of a LLNL calculation, and forward them out of their Gigabit Ethernet ports. Two V2001 Decoders at the ASCI Booth are responsible for decode and synchronization of received frames to be displayed to the tiled wall. Interactivity on remote images is provided using an USB-based keyboard and mouse (Figure 2).

Reference

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Point of Contact

Wes Bethel, ewbethel@lbl.gov
Helen Chen, hycsw@ca.sandia.gov
Milton Clauser, mjclaus@sandia.gov
Randy Frank, frank12@llnl.gov
Jeff Jortner, jnjortn@ca.sandia.gov
Lyndon Pierson, lgpiers@sandia.gov